Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

BCWGC DIAP Entomology Research Update

Pacific Agri-Food Research Centre
Summerland, BC

Canada

BCWGC DIAP Entomology Research

Vegetation Studies

GIS
Vegetation characterization
Insect surveys

Field Plantings
Native flowering plants
Native grasses
Legumes
Winter annual mustards

Lab Studies (cutworm)
Host suitability
Feeding preferences
Attractive baits

Toxicology

GIS
Insect surveys
Spray data

Efficacy Trials
Lab bioassays
Field trials
Delivery

Added Research
SWD, GLRaV

Beneficial Insects
Preservation
Anagrus tretiakovae survey
Cutworm parasites

Cutworm Pathology
Collecting and rearing of cutworm
Disease characterization
Lab efficacy trials
Cultural practices

Leafhopper Management
Antifeedants and repellents
Insecticide evaluations
WGLH survey

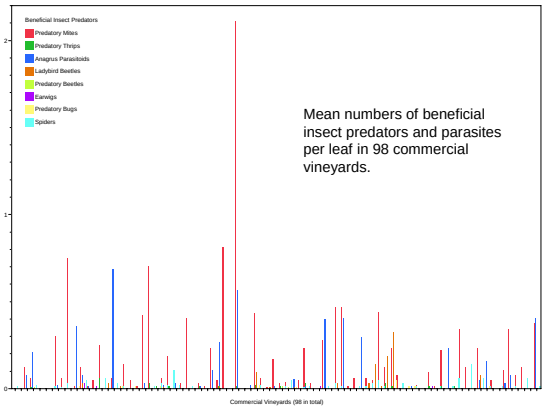
1. A GIS for Sustainable Viticulture Tailored to Terroir, cont'd (P. Bowen PI)

1.2 Characterize natural ecosystems …

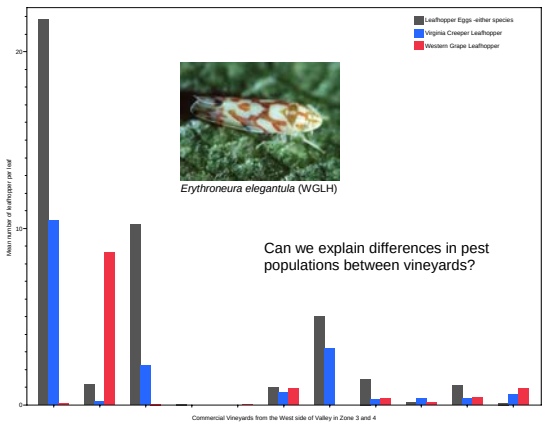
T. Lowery (PI), P. Bowen, C. Bogdanoff, O. Shaposhnikova (PDF)

We thank growers for their participation.

In addition to characterizing vegetation around and within vineyards, information on pesticide use allows us to evaluate their effects on populations of pests and beneficial insects.

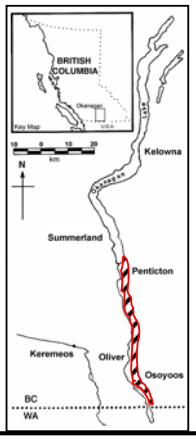


Mean numbers of beneficial insect predators and parasites per leaf in 98 commercial vineyards.



Erythroneura elegantula (WGLH)

Can we explain differences in pest populations between vineyards?



The WGLH was first found in 1997 on the east side of the Okanagan valley from Penticton to the U.S. border.

It has spread north of Penticton and also to the west side of the valley from the U.S. border north to Peachland.

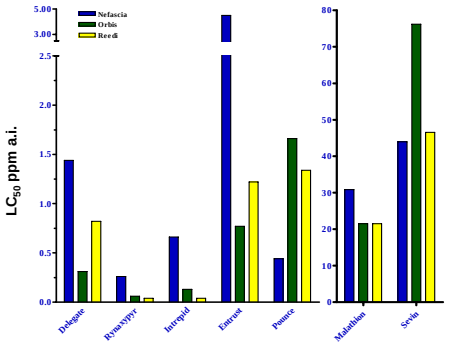
2. Reduced risk pesticides and novel approaches to control grape pests (T. Lowery PI).

2.1 Evaluation of reduced-risk insecticides and natural products for cutworm control; development of attractive cutworm baits.

M. Smirle (PI), T. Lowery

Progress:

- Laboratory efficacy trials completed for 8 insecticides (3 *Abagrotis* species; 2 larval ages).
- Detoxification enzyme activity levels established.
- Several bait components evaluated in laboratory choice test bioassays.
- Research with mustard meal discontinued due to lack of company support.



Susceptibility of 3 species of *Abagrotis* cutworm larvae (4th instar) to insecticides applied to leaf disks of Bok Choy.

Rynaxypyr = Altacor

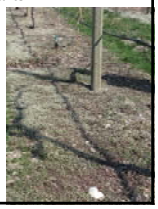
2. Reduced risk pesticides and novel approaches to control grape pests (T. Lowery PI).

2.3 Effect of winter annual mustards on cutworm feeding and survival; propagating and maintaining Draba and Shepherd's Purse; evaluation of spring-sown mustards; studies of beneficial native and non-native plants.

T. Lowery (PI), P. Bowen, C. Bogdanoff, K. Usher, M. Watson.

Justification:

- Movement to drip irrigation and need for drought-tolerant plants.
- Increased sustainability and environmental stewardship.
- Provision of nectar and alternate prey for beneficial insects.
- Nitrogen fixation.
- Non-chemical control of cutworm (trap crop).
- Development of attractive cutworm baits.



Experimental Plantings:

White Clover plots

Winter annual mustards: Replicated plots with and without Spring Draba and Shepherd's Purse in the vine row, and drive rows with grass or a mix of White Clover and Black Medic.

Drought tolerant grasses: Orchard Grass, Bluebunch Wheat Grass, Indian Rice Grass, Sand Dropseed, Sandberg Bluegrass, Idaho Fescue, Needle and Thread Grass, Buffalo Grass.

Snow Buckwheat

Native flowering perennials: Replicated plots planted with a mix of approximately 30 species of native drought tolerant flowering perennials.

Birdsfoot Trefoil

Nitrogen fixing groundcovers: Dutch White Clover, Black Medic, Sainfoin, Birdsfoot Trefoil (Large Head Clover part of native mix)

Cold hardy Brassicaceae: Fall or spring plantings of several commercial mustard crops, including Tah Tsai, Canola, Kale, …

Laboratory Bioassays with Cutworm:

Simple choice test bioassays have shown larval feeding preferences for Tah Tsai, Shepherd's Purse, and Spring Draba.

Research involving 'Y' tubes and plant extracts is ongoing in an attempt to isolate attractive and toxic compounds.

It has recently been discovered that larvae feed extensively on Common Mallow in spring. It and other plant species are being included in larval feeding and development trials.

Development and survival of *Abagrotis orbis* larvae reared in the laboratory on various plant species.

Tested plant	Pupal weight (mg)	Days to eclosion	% survival
Spring Draba	--	--	0.0
Shepherd's Purse	--	--	0.0
Joi Choi	373.9 a	93.4 a	36.1 cd
Arugula	238.0 de	114.0 ab	24.2 cd
Indian Mustard	308.9 bc	97.8 a	27.3 cd
Radish	327.0 b	100.5 a	51.5 bc
Tah Tsai	364.1 a	102.9 a	84.6 a
Lamb's Quarters	277.0 cd	108.3 a	69.7 ab
Dandelion	293.9 c	107.1 a	87.3 a
Garden Sorrel	194.3 ef	169.0 bc	12.1 d
Strawberry	167.2 f	198.1 c	27.3 cd
Grape leaves	--	--	0.0
White Clover	--	--	0.0

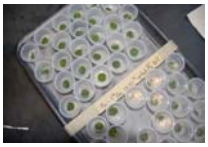
2.2 Cutworm Pathogens:

Evaluation of microbial pesticides; study of naturally occurring pathogens; influence of cultural practices on disease incidence.

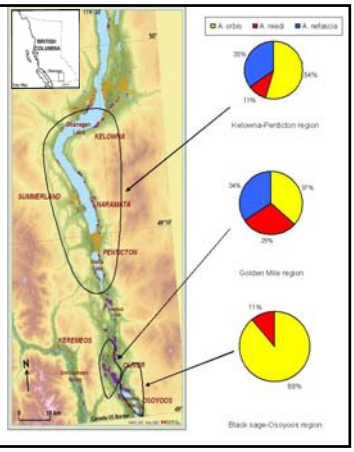
J. Cory (PI), T. Lowery, J. Cossentine, D. Theilmann.

A large proportion of the larvae we collect from the field die apparently of fungal, bacterial, or viral diseases.

Can we utilize naturally occurring or commercially available insect pathogens to help manage climbing cutworm pests of grapes?



Distribution of the three major species of climbing cutworm pests of grapevines.



Cutworm larvae collected in spring from grapevines and reared in the lab to maturity on either artificial diet or leaf material.

2011; reared on Tah Tsai.

Number collected – 788
Number that died – 449 (56.9%) → Studied for the presence of pathogens or frozen for future study. Parasites reared out.

Abagrotis orbis – 158
A. reedi – 82
A. nefascia – 35
Noctua comes – 12 Lesser Yellow Underwing, an invasive European species first collected by us in 2001.

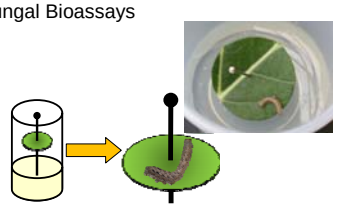
2010; reared on artificial diet.

Number collected – 414
Number that died – 143 (34.5%) → Frozen for future study. Parasites reared out.

Abagrotis orbis – 122
A. reedi – 43
A. nefascia – 29
Noctua comes – 15

- Have now identified over 20 species of climbing cutworm from grapevines, and have reared out several species of parasites.

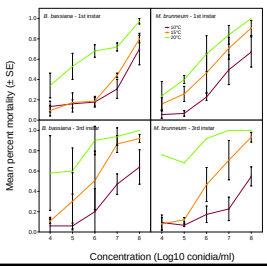
Laboratory Fungal Bioassays

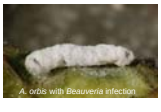


- Two entomopathogenic fungal isolates -*Metarhizium brunneum* *Beauveria bassiana*
- Two *Abagrotis orbis* instars – first and third
- Three rearing temperatures – 10 ºC, 15 ºC, 20 ºC

Status:

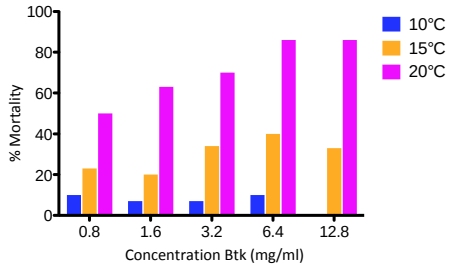
- *A. orbis* larvae were susceptible to both fungi
- susceptibility increased with temperature
- relatively high exposure concentrations were required to achieve > 50% mortality at the lower temperatures





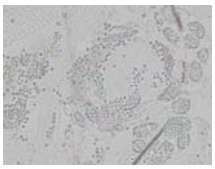
Data and graphs from MSc student Scott Johnson, SFU

Mortality of 1st Instar *A. orbis* larvae exposed to *Bacillus thuringiensis* (Dipel-2X) at three rearing temperatures.



Novel indigenous *Abagrotis* nuclear polyhedrosis virus (AbreNPV)

- Blast analysis found the virus to be similar to two other noctuid cutworm viruses, AgipMNPV and AgseNPV
- a grant proposal has been submitted for A-based AAFC funding to pursue the study of the AbreNPV – status still pending



AbreNPV infection in *Abagrotis* larva

Sequence analysis by Martin Erlandson, AAFC.

2.4 Leafhopper antifeedants and repellants; survey for the leafhopper egg parasite *Anagrus tretiakovae*; survey for WGLH; evaluation of insecticides for leafhopper control.

M. Smirle, T. Lowery

Progress:

- Antifeedant and repellent activity of fungicides and surfactants completed for VCLH.
- Collection of leafhopper egg parasites incomplete.
- Efficacy of Pyganic (natural pyrethrum) against leafhoppers evaluated in the lab and in the field.
- Survey for WGL partially completed.

Proportions of 2nd instar VCLH nymphs on treated leaf disks of grape versus untreated control disks after 24 hrs.

	0x	0.001x	0.01x	0.1x	1.0x	10x
Nova	46%	54%	48%	46%	44%	-
Sovran	52%	46%	51%	52%	43%	-
Vangard	54%	49%	61%	64%	47%	-
Cabrio	49%	51%	45%	44%	22%	5%
Boscalid	61%	49%	57%	46%	45%	-
Flint	56%	45%	44%	38%	24%	9%
Funginex	53%	54%	44%	50%	57%	-
Kumulus	47%	47%	54%	49%	42%	-
Agral-90	50%	46%	51%	42%	39%	9%
Companion	48%	50%	48%	52%	29%	16%
Sylgard	50%	51%	42%	42%	9%	2%

Treatment rates expressed as proportions of the recommended field rate

Additional Research Activities:

Surveys for grapevine leafroll associated viruses and potential vectors

J. Urbez, T. Lowery, M. Bernardy, D. O'Gorman, M. Jeffries, A-M. Schmidt.

- Samples from symptomatic vines collected in September and October and tested for GLRaV.
- location of infected vines mapped in large blocks of approximately 500 vines.
- Proposal to survey for GLRaV and insect vectors in 2012 submitted to BC Bio-Securities Program.

Photo: N. DeLury AAFC

Spotted Wing Drosophila Monitoring

T. Lowery, S. Achaempong, T. Hueppelsheuser

Progress:

- 22 traps used to monitor SWD throughout the 2010 season.
- 16 traps and 4 emergence cages operated until mid July, 2011; 22 traps after veraison.
- In 2011, SWD reared from intact and damaged table grapes and wine grapes; suitability of grapes as SWD hosts evaluated in the lab and linked to fruit maturity.

Thank you

Acknowledgements:

- **Cooperating industry members**
- **BC Wine Grape Council**
- **AAFC DIAP Initiative**
- **Numerous summer students and technical assistants**

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